

MARINE SAFETY MANUAL

- 3.E.3.b (4) (cont'd) are Class I. Systems that may be below 0°F for reasons other than the surrounding weather are Class I-L or II-L instead of Class I or II.
- c. Philosophy. Merchant ships do not carry large numbers of personnel as do Navy and Coast Guard ships. Therefore, the merchant ship substitute for active "damage control" is passive damage resistance. Piping is expected to resist noncombatant types of damage without intervention by the crew. Piping systems designed in accordance with 46 CFR 56 are assumed to have this resistance because they meet appropriate standards in each case for pressure-temperature safety factors, fire resistance, duplication, shock resistance, etc. The basic design standard is American National Standards Institute (ANSI) B31.1, the code used by the steam power plant industry ashore. It is comparable to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code in that it is based on a safety factor of four for primary ultimate tensile stresses, and the material properties are guaranteed by the use of acceptable specifications that call for both chemical and physical testing of each lot of material and other elements of quality control. ASME B31.1 is amended for marine use by several specific requirements of 46 CFR 56.
- d. Impact of SOLAS. The International Convention for the Safety of Life at Sea (SOLAS) (discussed in volume II of the manual) has the force of law. Accordingly, some of the Marine Engineering Regulations in 46 CFR Part 56 provide for differences for vessels on international or domestic voyages. Differences are in the areas such as fire mains, bilge systems, hull penetrations, overflows, overboard discharges, and collision bulkheads.
- e. Design Standards. As mentioned above, the design standards for piping systems are largely taken from ANSI B31.1, the "Power Piping" volume of the American National Standard Code for Pressure Piping. As a result of recent reorganization within ANSI and ASME, B31.1 will remain an American national standard, but will be called ASME B31.1. Any reference in this manual and in the Code of Federal Regulations to ANSI B31.1 applies equally to ASME B31.1, unless otherwise specified. This code, intended for steam power plants ashore, is modified for marine use by 46 CFR 56. General design requirements appear in subparts 56.07 and 56.60; specific design requirements are found throughout Part 56, particularly in 56.50. The basic design standard has a safety factor of four or five (between maximum primary membrane stress encountered in service and ultimate tensile strength of the material) for generally acceptable material specifications, depending on the level of design analysis, nondestructive examination, and hazard. When materials with lower levels of quality control are permitted, the safety factor should be increased proportionately. This safety factor may be as high as ten when completely untested but otherwise acceptable components are involved. It is thus difficult to separate "design" and "material" requirements in practice. Component standards like ANSI B16.5 and B16.34 provide excellent examples of the interplay between design details, pressure, temperature, material, and quality control. This is as true for systems as it is for components. The design standards are modified for marine application as follows: